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ABSTRACT

A key objective of a federally funded grant received by the Wake County Public Schools (North Carolina) was to develop new methods of assessment. The school district decided to fulfill this objective by developing student electronic portfolios. In spite of careful planning, the development of the electronic portfolios was filled with difficulties. Staff members persevered, developing electronic portfolios geared to the programs of six magnet elementary, middle, and high schools. Evaluation of the portfolio development process resulted in the identification of five specific lessons: (1) it may be better to develop traditional portfolios first and then mediate them; (2) schools should start small with this type of technology; (3) schools should take the time to find the right software for the electronic portfolios; (4) both students and teachers need to have access to the portfolio at any time from any place in the school; and (5) technology support is essential. (Contains 4 tables and 13 references.) (SLD)

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Is it Time to Circle the Wagons?
Lessons Learned in Pioneering Electronic Portfolios

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Introduction

Changes in teaching and learning stemming from the education reform movements of the late 1980s generated calls for new methods of assessment. The educational literature of the early to mid 1990s was replete with espousals of alternative assessment. Books and articles enumerated the advantages of performance and portfolio assessments, and related staff development materials proliferated (Herman, Aschbacher, & Winters, 1992; Fogarty, 1996). Some states added performance assessments to their accountability systems, and national testing programs developed performance-based items. Many articles and professional development materials during this period described the benefits and efficacy of new assessment methods (Mitchell, 1992). There was debate about the reliability and validity of new assessments (Messick, 1995), but little discussion about the resources necessary to develop and implement them, particularly when technology was involved in the development process.

One key objective of a federally funded grant received by the Wake County Public School System (WCPSS) in Raleigh, NC, was to develop new methods of assessment. Based on their research about and preview of assessments, teachers, administrators, and technology specialists at the six magnet schools in the grant decided to fulfill this objective by developing student electronic portfolios. Across the three years of grant implementation, achievement of this objective met with varying levels of success, and it is now possible to evaluate the benefits of these assessments; but, more importantly, to assess the difficulties in their development.

While pioneering electronic portfolios, there were times when grant staff considered "circling the wagons." In spite of careful planning, their journey was fraught with difficulties and delays. Because of glitches in portfolio software and the late arrival of computer hardware, assessments scheduled for completion in the first year had to be piloted with samples of students. Initial delays affected the entire timeline, but rather than circling the wagons, staff members were creative in their adaptations. They continued the journey—at a slower pace but still in a positive direction. Instead of complete portfolios planned for the first year, some schools developed specific segments to be plugged into the whole at a later date. Other schools kept the planned assessments intact, but implemented them with much smaller groups of students.

Methods

Part of the grant evaluator's role was to oversee development of the alternative assessments. A mixed-method approach was used to evaluate this aspect of the grant (Greene & Caracelli, 1997). The evaluator attended portfolio planning meetings of the grant leadership team, keeping field notes and developing tables to depict and describe similarities and differences in the approaches used at each school (Tables 1, 2, & 3). She visited schools to observe during all stages of the development process and returned to view completed portfolios for a sample of students. After grant staff members attended national meetings and visited other schools and districts to gather information about electronic portfolios and portfolio software, they met with the evaluator to discuss their findings and how this information would affect the portfolio process at each school.

Magnet schools in the grant offered a variety of themes ranging from Arts and Science or Montessori Programs at the elementary schools, Academically Gifted/Gifted and Talented Programs at the middle schools, and Interdisciplinary Teaming or Accelerated Learning at the high schools (Table 1). The specific objective that the portfolios addressed was "to explore and establish new methods for assessing student progress related to new or revised magnet themes" (WCPSS, 1995). Portfolios were tailored for the specific theme at each school, so their formats differed. The evaluator reviewed portfolio output in both electronic and print formats, and she interviewed administrators and magnet staff about the effectiveness of the development process and the utility of the portfolios. Focus groups were used to identify concerns of technology specialists working at grant schools. Other data sources included: field notes of magnet staff meetings; regular on-site observations at each school; tables of similarities and differences by school—revised and tracked over time; debriefings of magnet staff after trips to conferences and other districts; and audits of electronic and printed versions of portfolios.

The Development Process

Software Selection and Hardware Issues

Having decided to "establish new methods for assessing student progress" by developing electronic portfolios, staff members needed to select software for that purpose. Through the grant, each school had a staff member one-third to one-half time who had technology training and certification. In the fall of 1995, they assisted other staff members in reviewing available software with capabilities for developing portfolios. There were numerous data-base "plus" types of programs for storing

Table 1. Schools & Magnet Themes, Year 1
Software, Student Sample, Professional Development, and Type of Assessment

School & Magnet Theme	Software	Pilot Sample	Professional Development	Type of Assessment
Elementary Integrated Arts, Science, & Technology	Grady Profile	Sample of students from first and fifth grades	Three-day training for grant staff with SERVE consultant; first and fifth grade teachers trained by grant staff	Electronic portfolio with emphasis on multiple intelligences in an integrated arts and science setting
Elementary Montessori	Grady Profile	All students in two pre-K/K Montessori classrooms	Three-day training for grant staff with SERVE consultant; Two pre-K/K Montessori teachers trained by grant staff	Electronic behavioral checklist with Montessori observables
Middle Multiple Intelligences	Grady Profile	All 15 students in one 6th grade language arts class, all 23 students in one 6th grade science class	Three-day training for grant staff with SERVE consultant; 6th grade language arts and science teacher trained by grant staff	Electronic portfolio using oral reading passage, student and teacher use rubric to evaluate reading
Middle Multiple Intelligences	Hyper Studio-Type Software	Sample of 40 6th grade students	Three-day training for grant staff with SERVE consultant; two 6th grade language arts teachers trained by grant staff	Electronic portfolios including multiple intelligences profiles
High Interdisciplinary Teaming	Grady Profile	Sample of 14 students on Interdisciplinary Team	Three-day training for grant staff with SERVE consultant; four teachers on 9th-grade Interdisciplinary Team trained by grant staff	Electronic portfolios emphasizing interdisciplinary approaches, student work samples, rubrics for scoring
High Math, Science, & Technology	School Vista	Planning year; school opened in fall 1997	NA	NA

student information, photos, and class work, but few programs with capabilities for capturing and organizing audio, video, and graphics exhibits. From the few with these additional capabilities, three schools chose Grady Profile (Aurbach Associates), one decided to use Hyper Studio, and one selected a Hyper Studio-type package that would run on both Mac and IBM computers. The sixth school, a new high school being planned for 1997, later decided to use IBM School Vista. Even though portfolio software choices were similar, usage differed because of the varied magnet themes and grade levels of the schools (Table 1).

The technology specialists reviewed computer hardware and related software programs available at each school to determine the amount of existing support for the portfolio software. According to the district-wide technology plan, local area networks (LANs) were scheduled to be in place at most grant schools by November 1995, and the LANs were factored into the schools' ability to support portfolios and store related files. The grant budget provided some funding for equipment to supplement what was available at the schools. As November 1995 came and went without installation of the LANs, it became clear that storage devices would be needed for the portfolios, which would contain data-dense audio and video files for large numbers of students.

As with the LAN installations, other technology-related delays arose early on, e.g., late arrival of the portfolio software and/or computers on which to run it and withdrawal of the Hyper Studio-type software product from the market. One of the elementary schools planned to collect individual student data using Grady Profile on Newtons and then transfer files to larger classroom computers. Their technology specialist spent large amounts of time and many telephone hours with technical support trying to transfer files successfully. Due to such delays, magnet staff decided to pilot their electronic portfolios with samples of students during the first year of the grant, make revisions and implement them with larger student groups in year two, and complete portfolios across an entire grade level in year three. First year student samples are described in Table 1; Tables 2 and 3 show the evolution of these plans in the second and third years of the grant.

Professional Development

Professional development for grant staff and appropriate teachers at their schools began in year one. Magnet staff attended national alternative assessment and technology conferences and visited other schools and systems using technology to develop student information management systems and/or electronic portfolios. A consultant from the federal regional educational laboratory in Greensboro, NC (SouthEastern Regional Vision for Education, SERVE) provided a three-day workshop

Table 2. Schools & Magnet Themes, Year 2
Software, Student Sample, Professional Development, and Type of Assessment

School & Magnet Theme	Software	Student Groups	Professional Development	Type of Assessment
Elementary Integrated Arts, Science, & Technology	Grady Profile (LAN not available)	All fifth grade students	Grant technology specialist, fifth grade teachers, and two arts teachers work with SERVE consultant for 12 days during school year	Electronic portfolio using music and dance to assess social studies unit on regions of US geography
Elementary Montessori	Grady Profile (LAN not available)	Sample of students in two pre-K/K Montessori classrooms	Pre-K/K Montessori teachers use Grady on their own	Student behaviors recorded with Newtons
Middle Multiple Intelligences	Grady Profile (LAN not available)	Paper-and-pencil portfolios completed by 50% of all 7th grade students	All 7th grade teachers receive portfolio and technology training	Paper portfolios for 50% of 7th grade; sample of student work put into electronic format
Middle Multiple Intelligences	Hyper Studio (LAN available but dedicated for Web access)	All 7th grade students for traditional portfolios; sample of 20 7th graders complete electronic portfolios	Multiple Intelligences/Alternative Assessment training for all 7th grade teachers	Traditional portfolios for all 7th graders; Electronic portfolio template developed by technology specialist; sample of 7th grade students enter work
High Interdisciplinary Teaming	Grady Profile (LAN available for half of year)	Sample of students on Interdisciplinary Team	9th-grade Interdisciplinary teachers attend SERVE and other regional workshops on assessment	Electronic portfolios completed for less than half of students; Access extremely difficult prior to completion of LAN
High Math, Science, & Technology	School Vista (LAN planned)	Construction year; school opened in fall 1997	Planning includes assessment development training	NA

Table 3. Schools & Magnet Themes, Year 3
Software, Student Groups, Professional Development, and Type of Assessment

School & Magnet Theme	Software	Student Groups	Professional Development	Type of Assessment
Elementary Integrated Arts, Science, & Technology	Grady Profile (LAN not available)	All students in K, 1st, 4th and 5th grades use alternative assessments; electronic aspect very limited due to delays with LAN	Grade K, 1, 4, and 5 teachers complete 4 days of training as part of SERVE research and development site	Teachers and arts specialists incorporate the arts into subject-area assessments; electronic aspects to be added when LAN is ready
Elementary Montessori	Grady Profile (LAN not available)	All students in two pre-K/K Montessori classrooms	Two pre-K/K Montessori teachers continue to follow students, but use Access software versus Newtons and Grady Profile	Behavioral checklists in use, Newtons and Grady replaced with Access data bases
Middle Multiple Intelligences	Grady Profile (LAN not available)	All 8th graders have paper-and-pencil portfolios; 20 8th graders have completed electronic portfolios	All teachers on 8th grade teams meet with evaluator to discuss criteria for portfolio audits	Electronic portfolios completed for 20 students in computer elective; traditional portfolios complete for all 8th graders, quarterly portfolio audits by evaluator
Middle Multiple Intelligences	Hyper Studio (LAN available but dedicated for Web access)	All 8th grade students have traditional portfolios based on Multiple Intelligences template and also have put them onto Hyper Studio	8th grade teachers complete Hyper Studio training	Electronic portfolios based on multiple intelligences profiles completed for all 8th graders; fourth-quarter audit by evaluator
High Interdisciplinary Teaming	Hyper Studio (LAN available and used for portfolios)	All 80 9th graders on Interdisciplinary Team	Interdisciplinary team teachers and technology specialist complete 4 days of training as part of SERVE research and development site	Electronic portfolio emphasizing interdisciplinary approaches, student work samples, rubrics for scoring
High Math, Science, and Technology	School Vista (LAN available)	School opened in fall 1997; portfolios begun for sample of 9th grade students; Portfolio exhibition will be a graduation requirement when they reach 12th grade	Staff development institute prior to opening of school	Electronic portfolios for sample of 9th grade students

in alternative assessment, which included a train-the-trainers component so staff could begin to work with teachers at their schools. With electronic portfolios, it was also necessary to provide specialized technology training for school staff members. Staff development, in alternative assessment and in technology, continued in years two and three (Tables 2&3).

Training in the structure and development of portfolios was more successful than technology training for the electronic aspects of the portfolios. Teachers, many of whom use some form of traditional portfolios for students, had a frame of reference for this aspect of the training. But most of them approached technology training with the misgivings and anxieties typical of adults facing some new requirement of the computer age. Glitches and user-unfriendliness of some of the portfolio software did nothing to allay that anxiety.

The Pioneer Trail

The difficulties in finding the time in teachers' already overcrowded schedules for training in both assessment development and software use were a challenge. Once time was found, the problems that even computer-savvy teachers had mastering the software elicited some "circle the wagons" feelings. Such sentiments occurred earlier for some of the technology specialists who logged innumerable hours trying to get the software to function properly so teacher training would go smoothly. Schools that used Hyper Studio had fewer problems because this was not a new product for them. But even at these schools, difficulties arose with regard to storage capacity for computer files as large as the portfolios. Hard drives, even on the new computers purchased through the grant, quickly filled up, leaving insufficient room for students to work on or store their portfolios. Staff members anticipated that the LANs would solve this problem once they were up and running at the three schools expecting them. The November 1995 date for this passed with assurances that the networks would be in place "after the holidays." As of April 1998, two of the three schools are still waiting. (No disparagement of the WCPSS technology department is intended; delays such as this are related to the enormity of installing networks in a system of over 100 schools serving almost 90,000 students, rather than any deficits in the department.)

Not only were computer drives filled up, computer labs filled up also. Large numbers of students and teachers needed ready access to computers for structuring the portfolios and entering or scanning in work. Without easy assess to networks, schools had to rely on their existing computer labs. At most schools, these laboratories stay fully scheduled for technology classes as well as for the state-required computer competence testing. Booking blocks of lab time became quite a challenge; and, rather

than circling the wagons, staff members became very creative at this. For example, some teachers took their classes to the labs during homeroom periods. At other schools, electronic portfolio development was taught as an elective or combined with other electives that were already scheduled into the computer labs.

The "circle the wagons" sentiment was strongest during a meeting of grant staff at the beginning of the 1997-98 school year—the third year of the three-year grant. Those attending were aware of the objective committing them to develop "new methods of assessing student progress." In spite of time and effort devoted to it thus far, the objective seemed beyond reach because of technology problems associated with the electronic portfolios. It seemed that the decision to develop electronic portfolios had been made just ahead of the time when such an undertaking would have been more feasible. For example, when completed, installation of LANs at every school will provide sufficient storage space and allow student and teacher access from classrooms as well as computer labs. The staff's review of software coming onto the market indicated that products are developing better portfolio capabilities and becoming easier to use. The development of writeable CD ROMs and wider availability of Jazz and Zip drives will help with storage problems.

For the time being, it was clear to those meeting in September of 1997 that the major difficulties were with technology, rather than with the portfolios themselves. Only a certain portion of the technology problems could be remedied in the coming year. But the portfolios themselves, rather than their electronic aspects, could be emphasized for year three and could provide an effective means of fulfilling this grant objective. In the remainder of the September meeting and in subsequent meetings during the fall, staff members made plans to troubleshoot technology problems whenever possible but to emphasize the old-fashioned, paper-and-pencil aspects of the portfolios. Through this plan, some schools were able to develop full-fledged electronic portfolios for an entire grade-level of students; whereas others stressed traditional portfolios for all students, with small groups of students putting theirs into electronic format through previously scheduled computer electives. Whatever the plan (see Table 3), the portfolios themselves became an effective assessment method. And, because staff working on portfolio development for this grant did not circle the wagons, they learned lessons that will be valuable to others beginning a similar journey.

Lessons Learned

Analyses of the various difficulties associated with alternative assessments are beginning to appear in the literature (Hardy, 1996; Monk, 1996; Stecher & Klein, 1997). Results of this study are consonant with those findings, especially with regard to the incremental difficulties when new assessments are combined with technology to create electronic portfolios.

Based on analyses of information from the multiple data sources in this study, several categories of difficulties and benefits have been identified. Difficulties had to do with aspects of technology such as: access to and/or purchase of computers; obtaining electronic portfolio software and training teachers and students to use it; ensuring access to portfolios while maintaining appropriate security; finding sufficient electronic storage space for multimedia segments of portfolios; and installing school-wide computer networks and servers to support portfolios.

Benefits having to do with technology included improvements in teacher and student computer skills; storage of and access to paper-and-pencil student work as well as artwork, photos, and audio- and video clips; and the ability to integrate instruction when students and teachers can access portfolios in any subject from any classroom. Because LANs are still not fully functional at study schools, some potential benefits have not been realized yet: storage space for graphics-rich portfolios remains a problem and access to portfolios is still mainly through the computer labs rather than in classrooms (Table 4).

This is a time when many schools and school systems are developing or planning to develop portfolio systems, and many of these will be coupled with technology to develop electronic portfolios. Such an approach is espoused in the literature, but there is a dearth of information from those who have already undertaken the journey. The lessons learned in this study are timely and should be of real assistance to others beginning a similar journey.

1. It may be better to develop effective traditional (i.e., not electronic) portfolios first and mediate them later. By doing both at the same time, schools in this study more than doubled the time and effort needed. And at times the technology overshadowed the curricular goals that the portfolios were designed to serve (Harrington-Lueker, 1997). The staff decision in September 1997 to re-focus on the traditional aspects of the portfolios brought curriculum rather than technology issues to the fore. Thus, the final portfolios, though not all in electronic format, were aligned to the curriculum and contributed to effective planning and implementation of instruction.

Table 4. Storage Methods Used in Year 3

School & Magnet Theme	Software	Year 3 Student Groups	Storage Methods & Effectiveness
Elementary Integrated Arts, Science, & Technology	Grady Profile (LAN not available)	Sample of students from kindergarten, first, fourth, and fifth grades	One Zip drive per classroom; Due to nature of exhibits in performing arts school, one Zip drive per 5-10 students would be better
Elementary Montessori	Grady Profile (LAN not available)	All students in two pre-K/K Montessori classrooms	Hard drives on classroom computers using Access data base software; Working well, teachers are comfortable using Access software
Middle Multiple Intelligences	Grady Profile (LAN not available)	All 8th graders have paper-and-pencil portfolios; 20 8th graders have completed electronic portfolios	Lead teacher on each 8th grade team stores traditional portfolios; Working version of electronic portfolios stored on computer lab hard drives; Storage space a definite problem with all other demands on computer lab; Final version of electronic portfolios will be written on to CDs for students to keep
Middle Multiple Intelligences	Hyper Studio (LAN available but dedicated for Web access)	All 8th grade students have traditional portfolios based on Multiple Intelligences template and also have put them onto Hyper Studio	Electronic portfolios stored on hard drives of laboratory computers to be used in conjunction with diskettes that students keep in their traditional portfolio folders; Hard drive storage space is a problem; Need for students to use their diskettes on the computer where related hard-drive materials are located is awkward; Computer failures are frequent because of maxed-out hard drives on older machines
High Interdisciplinary Teaming	Hyper Studio (LAN available and used for portfolios)	All 80 9th graders on Interdisciplinary Team	Portfolios stored on network
High Math, Science, and Technology	School Vista (LAN available)	School opened in fall 1997; portfolios begun for sample of 9th grade students; Portfolio exhibition will be a graduation requirement when they reach 12rh grade	Portfolios stored on network

2. Results of this study, like Harrington-Lueker's, indicate that schools should "start small" with this type of technology. The original vision of the grant team was to develop electronic portfolios for all students in all grades within three years. As described earlier, technology delays quickly affected that timeline. Schools then worked with samples of students at a single grade level, eventually including entire grade levels by the end of the project.

3. Take time to find the right software for electronic portfolios. Schools in this study tried four different software programs, none of which handled well both the database and multimedia aspects needed for electronic portfolios. Also invest the time to use software before adopting it; do not rely solely on producers' brochures and demonstrations. Pre-plan the portfolio format and contents and then pilot that with any software you anticipate purchasing.

4. To develop and maintain electronic portfolios, both students and teachers need access to portfolios at anytime from anywhere in the school. This means that a local area network should be fully functional before undertaking a project of this sort. The LAN allows access, and it allows storage space. Electronic portfolios, particularly those including multimedia, require large amounts of storage.

5. Technology support is essential. The staffing for this project was a single one-third to one-half time position for computer support at each school. All technology specialists in those positions were well-trained and experienced but could not provide sufficient coverage in part-time positions. They also had to contend with major software difficulties of programs not completely suited to the needs of electronic portfolios. When using software this complicated, it can be anticipated that technology staff will need time to maintain software, to troubleshoot, and to train and support teachers.

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